

Hydrophilic Treatment Procedure for HYDRAsub[®]-MBR

The following procedure describes hydrophilization, or wetting of HYDRAsub[®]-MBR membranes that have become hydrophobic due to drying. Drying may occur when the membranes have gotten wet either by being immersed or by ambient conditions (rain, humidity, etc.) and then were removed from the conditions to allow them to dry out.

A surfactant solution is used to re-wet the membranes. Contact Hydranautics for chemicals that have been approved for this purpose.

Step 1: Preparation of surfactant solution

Add the required amount of surfactant to prepare 0.3% concentration solution in the backwash tank. The surfactant has high viscosity so it should be poured in gradually to achieve effective mixing. The surfactant solution should be kept above 15 degrees Celsius so that the viscosity of the final solution is in the required range.

Solution volume, $V(L)$

$$\begin{aligned} &= [\text{Membrane area } (X \text{ m}^2) \times \text{Backwash flux } (4 \text{ L/m}^2/\text{hr}) \times \text{Backwash duration } (0.5 \text{ hr})] + \\ &\text{Holdup volume in pipes } (V_h \text{ L}) + \text{Dead volume in backwash tank } (V_t \text{ L}) \\ &= [(4 \text{ L/m}^2)(0.5 \text{ hr}) X] + V_h + V_t \\ &= (2\text{L/m}^2) X + V_h + V_t \end{aligned}$$

E.g., For a membrane area of 44 m², the solution volume, V , in liters, will be

$$\begin{aligned} &= (2\text{L/m}^2)(44\text{m}^2) + V_h + V_t \\ &= 88\text{L} + V_h + V_t \end{aligned}$$

To treat the membranes using the soak method as described below, the membranes must be fully immersed in the surfactant solution. It is recommended to use the smallest tank possible so that the chemical usage is minimized.

Weight of surfactant, W_s (grams) to be added

$$\begin{aligned} &= \text{Solution volume } (V \text{ L}) \times \text{Concentration } (3 \text{ g/L}) \\ &= (3 \text{ g/L}) V \text{ (L)} \end{aligned}$$

E.g., For a solution volume of 100 L, the weight of surfactant to be added would be
 $= (3\text{g/L}) (100\text{L}) = 300 \text{ g}$

Step 2: Hydrophilization

a) Hydrophilization by surfactant backwash

Lower the membrane module into the tank and connect the piping (filtration header). Fill the tank with clean water until the module is completely submerged. Let the module soak for one hour prior to adding the surfactant solution. Backwash the required volume of surfactant solution at a flux of 4 l/mh (2.4 gfd) (approximately 30 minutes) while ensuring that the backwash pressure does not exceed 0.15 bar (2 psig).

Let the module soak for one more hour. Backwash with clean water at a flux of 6 l/mh (3.5 gfd) for 30 minutes while ensuring that the backwash pressure does not exceed 0.15 bar (2 psig). The clean water should flush out any surfactant solution remaining in the membrane lumen and pores. After the clean water backwash, the membrane can be put into operation. The surfactant solution should be drained from the tank and disposed of per site-specific discharge requirements.

b) Hydrophilization by surfactant soak

If a setup for backwashing the affected elements or modules is not readily available, hydrophilization can be carried out by soaking the membrane in the surfactant solution. The elements should be completely submerged in a tank containing the 0.3% surfactant solution for a period of one hour. After the soak, the elements are ready to be installed into the module and put into the membrane tank. It is recommended to put the membranes into operation as soon after the surfactant soak as possible to ensure the hydrophilic coating is in tact.

If required, the first 10-15 minutes of filtrate can be diverted to remove any remaining surfactant from the membrane lumen. Be sure to dispose of any chemicals per site-specific requirements.

If the membranes have been used and are to be stored for a period of time, a hydrophilic treatment may be done prior to letting the membranes dry out. Firstly, a CEB on the module(s) to be removed should be done. The cleaning will be more effective if done in clean water. All elements should be removed and individually cleaned off as much as possible preceding the hydrophilic treatment. The surfactant solution for a soak can be prepared as described above. For used elements, care must be taken to prevent solids from entering the fiber lumen. To avoid this, permeate adapters can be placed on either side of the element and tilted up to remain above the water level in the tank. This will keep any debris outside of the fibers while also allowing air to vent as the lumen fill with solution. Let the elements soak for 60 minutes and then remove from the soak tank. Allow excess solution to drain from the elements before setting them aside to dry. A covered area, free from direct sunlight, extreme temperatures, sharp edges or debris, rain and moisture is an ideal location to dry and store the membranes. The elements should be placed upside down with the permeate adapter openings at the bottom so

that the solution can completely drain from the element while drying. The drying process may take up to seven days depending on temperature and humidity.

Note: Wetting is complete when the permeability of clean membranes in clean water is between 10-30 gfd/psig (246-738 lmh/bar), depending on system arrangement. If permeability is not achieved, please contact Hydranautics.

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